Inner ear hair cell-like cells from human embryonic stem cells.

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Authors: Mohammad Ronaghi, Marjan Nasr, Megan Ealy, Robert Durruthy-Durruthy, Joerg Waldhaus, Giovanni H Diaz, Lydia-Marie Joubert, Kazuo Oshima, Stefan Heller

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Public Summary:
In mammals, the permanence of many forms of hearing loss is the result of the inner ear's inability to replace lost sensory hair cells. Here, we apply a differentiation strategy to guide human embryonic stem cells (hESCs) into cells of the otic lineage using chemically defined attached-substrate conditions. The generation of human otic progenitor cells was dependent on fibroblast growth factor (FGF) signaling, and protracted culture led to the upregulation of markers indicative of differentiated inner ear sensory epithelia. Using a transgenic ESC reporter line based on a murine Atoh1 enhancer, we show that differentiated hair cell-like cells express multiple hair cell markers simultaneously. Hair cell-like cells displayed protrusions reminiscent of stereociliary bundles, but failed to fully mature into cells with typical hair cell cytoarchitecture. We conclude that optimized defined conditions can be used in vitro to attain otic progenitor specification and sensory cell differentiation.

Scientific Abstract:
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